USER MANUAL

MODEL 2720/I Series

NetLink-T1™

T1/Fractional T1 CSU/DSU

PATTON Electronics Co.

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ISO 9001 CERTIFIED

An ISO-9001 Certified Company

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1.0 WARRANTY INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

1.1 WARRANTY STATEMENT

Patton Electronics warrants all Model 2720 Series components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment. This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse, or unauthorized modification. This product contains no serviceable parts; therefore you should not attempt to modify the unit in any way. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms. In the event that you detect intermittent or continuous product malfunction due to nearby high power transmitting radio frequency equipment, use only data cables with an external outer shield bonded to a metal or metalized connector.

WARNING! ⊗ This device is not intended to be connected to the public telephone network in Europe.

1.2 RADIO AND TV INTERFERENCE

The NetLink-T1™ Model 2720 Series generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model 2720 Series has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 2720 Series causes interference to radio or television reception, which can be determined by disconnecting the cables, try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.3 INDUSTRY CANADA NOTICE

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above condition may not prevent degradation of service in some situations. Repairs to some certified equipment should be made by an authorized maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the ground connections of the power utility, telephone lines and internal metallic water pipe system, are connected together. This protection may be particularly important in rural areas.

1.4 FCC INFORMATION

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Model 2720 Series has been tested and registered in compliance with the specifications in Part 68 of the FCC rules. A label on the equipment bears the FCC registration number. You may be requested to provide this information to your telephone company. Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper operation of the Model 2720 Series. If this happens, the telephone company should give you advance notice to prevent the interruption of your service. The telephone company may decide to temporarily discontinue your service if they believe your Model 2720 Series may cause harm to the telephone network. Whenever possible, they will contact you in advance. If you elect to do so, you have the right to file a complaint with the FCC. If you have any trouble operating the Model 2720 Series, please contact Patton Electronics Technical Support 301-975-1000. The telephone company may ask you to disconnect the equipment from the telephone network until the problem has been corrected or until you are certain that the Model 2720 Series is not malfunctioning. In accordance with FCC rules and regulation CFR 47 68.218(b)(6), you must notify the telephone company prior to disconnection. The following information may be required when applying to your local telephone company for leased line facilities. The Universal Service Order Code (USOC) is

RJ48. The Facility Interface Codes (FIC) are 04DU9-BN, 04DU9-DN, 04DU9-1KN, and 04DU9-1SN. The Service Order Code (SOC) is 6.0N.

1.5 SERVICE INFORMATION

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Support at: tel: **(301) 975-1007** email: **support@patton.com** www: **http://www.patton.com. NOTE:** Packages received without an RMA number will not be accepted. Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Patton Model 2710RC. Technical Support hours: **8AM to 5PM EST, Monday through Friday.**

1.6 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions arise during installation or use of the unit, contact Patton Electronics Technical Services at (301) 975-1007.

2.1 FEATURES

- Terminates T1/FT1 Circuits over a 4-Wire RJ-48C interface
- 10Base-T Ethernet bridge
- PPP (Point to Point Protocol, RFC 1661) with Bridge Control Protocol (RFC 1638)
- Unstructured Rates at 1.544 Mbps
- D4 or ESF Framing Modes
- Supports AMI or B8ZS/B7ZS Line Coding
- Configuration via Software Control Port or Internal DIP Switches
- Six Easy-to-Read LED Indicators Monitor Data & Diagnostics
- Internal, External or Receive Recover Clocking
- Also Operates as a High-Speed Point-to-Point Modem
- Made in USA

2.2 GENERAL PRODUCT DESCRIPTION

The *NetLink-T1™* Model 2720 Series are single port T1/FT1 CSU/DSUs that provide high-speed WAN connectivity. Plugging directly into the serial WAN port of a switch, router or multiplexer, the NetLink-T1™ provides T1 or FT1 access at connection data rates of 1.544 Mbps, nx64, and nx56 (n=1 to 24 channels). The Netlink-T1™ is an excellent choice when terminating leased line services, Frame Relay backbones, internet access as well as LAN-to-LAN services.

The Netlink-T1™ provides digital access to a local WAN service provider or directly between two facilities over a dedicated 4-Wire circuit. WAN bandwidth, framing and coding options are programmed via externally accessible DIP switches or via a VT-100 type terminal using the rear-mounted EIA-232 Control Port. Netlink-T1™ supports D4/ESF framing options and AMI/B8ZS/B7ZS line coding. Netlink-T1™ also supports a full range of system and diagnostic features that make system setup easy.

The NetLink-T1™ provides T1 terminations over a modular RJ-48C jack and comply with jitter tolerance capabilities as specified in ANSI T1.403 and AT&T TR62411. External power options include 120VAC and universal interface 100-240VAC. 48VDC and rack card versions are also available.

3.0 PPP Operational Background

PPP is a protocol used for multi-plexed transport over a point-to-point link. PPP operates on all full duplex media, and is a symmetric peer-to-peer protocol, which can be broken into three main components: 1. A standard method to encapsulate datagrams over serial links; 2. A Link Control Protocol (LCP) to establish, configure, and test the data-link connection; 3. A family of Network Control Protocols (NCPs) to establish and configure different network layer protocols.

In order to establish communications over a point-to-point link, each end of the PPP link must first announce its capabilities and agree on the parameters of the link's operation. This exchange is facilitated through LCP Configure-Request packets.

Once the link has been established and optional facilities have been negotiated, PPP will attempt to establish a network protocol. PPP will use Network Control Protocol (NCP) to choose and configure one or more network layer protocols. Once each of the network layer protocols have been configured, datagrams from the established network layer protocol can be sent over the link. The link will remain configured for these communications until explicit LCP or NCP packets close the link down, or until some external event occurs.

The PPP Bridging Control Protocol (BCP), defined in RFC 1638, configures and enables/disables the bridge protocol on both ends of the point-to-point link. BCP uses the same packet exchange mechanism as the Link Control Protocol (LCP). BCP is a Network Control Protocol of PPP, bridge packets may not be exchanged until PPP has reached the network layer protocol phase.

3.1 APPLICATIONS

In situations where a routed network requires connectivity to a remote Ethernet network, the interface on a router can be configured as a PPP IP Half Bridge. The serial line to the remote bridge functions as a Virtual Ethernet interface, effectively extending the routers serial port connection to the remote network. The bridge device sends bridge packets (BPDU's) to the router's serial interface. The router will receive the layer three address information and will forward these packets based on its IP address.

Figure 1 shows a typical Cisco router with a serial interface configured as a PPP Half Bridge. The router serial interface uses a remote device that supports PPP bridging to function as a node on the remote Ethernet network. The serial interface on the Cisco will have an IP address on the same Ethernet subnet as the bridge.

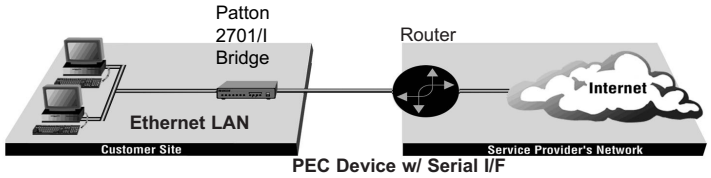


Figure 1. Cisco router with serial interface, configured as PPP Half Bridge.

For example, the customer site is assigned the addresses 192.168.1.0/24 through 192.168.1.1/24. The address 192.168.1.1/24 is also the default gateway for the remote network. The above settings remove any routing/forwarding intelligence from the CPE. The associated Cisco configuration will set serial interface (s0) to accommodate half bridging for the above example.

Authentication is optional under PPP. In a point-to-point leased-line link, incoming customer facilities are usually fixed in nature, therefore authentication is generally not required. If the foreign device requires authentication via PAP or CHAP, the PPP software will respond with default Peer-ID consisting of the units Ethernet MAC address and a password which consists of the unit's Ethernet MAC address.

Some networking systems do not define network numbers in packets sent out over a network. If a packet does not have a specific destination network number, a router will assume that the packet is set up for the local segment and will not forward it to any other sub-network. However, in cases where two devices need to communicate over the wide-area, bridging can be used to transport non-routable protocols.

Figure 2 illustrates transparent bridging between two routers over a serial interface (s0). Bridging will occur between the two Ethernet Interfaces on Router A (e0 and e1) and the two Ethernet Interfaces on Router B (e0 and e1).

```
!
no ip routing
!
interface Ethernet0
ip address 1.1.1.1 255.255.255.0
bridge-group 1
!
interface Serial0
ip address 1.1.1.1 255.255.255.0
encapsulation PPP
bridge-group 1
!
interface Serial1
ip address 2.2.2.2 255.255.255.0
bridge-group 1
!
bridge 1 protocol ieee
!
```

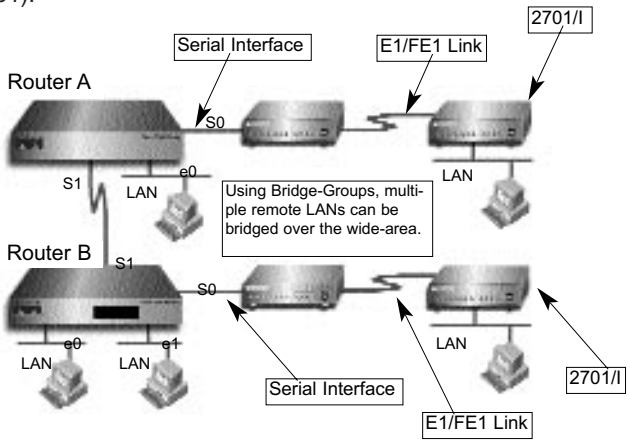


Figure 2. Transparent bridging between two routers over a serial interface.

3.1.1 Switch S2

The table below shows the default configurations for Switch S2. A description of all S2 options follows this table.

S2 SUMMARY TABLE			
Position	**Function**	**Factory Default**	**Selected Option**
S2-1	Data Rate	On	1.536 Mbps (DTE Rate)
S2-2	Data Rate	On	
S2-3	Data Rate	On	
S2-4	Framing & Coding	Off	ESF/B8ZS
S2-5	DS Zero Rate	On	64 kbps
S2-6	Clock Mode	Off	Network
S2-7	Clock Mode	Off	Network
S2-8	Reserved	Off	Reserved

Switches S2-1, S2-2, and S2-3

Use Switches S2-1, S2-2 and S2-3 to set the DTE data rate. Each setting represents an nx56/nx64 setting. Individual channel settings can be configured through the software control port.

S2-1	S2-2	S2-3	Speed
Off	Off	Off	Clear Channel (Unframed)
On	Off	Off	112kbps/128kbps
Off	On	Off	224kbps/256kbps
On	On	Off	336kbps/384kbps
Off	Off	On	448kbps/512kbps
On	Off	On	672kbps/768kbps
Off	On	On	896kbps/1024kbps
On	On	On	1344kbps/1536kbps

Switch S2-4: Line Framing and Coding

Use Switch S2-4 to control the Network Line Framing and Coding Options. Set these options to be the same as the Line Framing and Coding Options given to you by your Service Provider. If you are using two Model 2720s together as short range modems, set both units identically.

S2-4	Line Framing & Coding
Off	ESF/B8ZS
On	D4/AMI

Line Framing Options:

D4/Superframe: The D4 framing format, as specified in AT&T TR62411 is the standard in which twelve frames make up a superframe. All signaling and synchronization are done in-band.

Extended Superframe (ESF): Extended Superframe, as specified in AT&T TR 54016, consists of twenty-four (24) T1 frames. The framing bits are now used for framing, CRC and the Facility Data Link (FDL). The FDL allows maintenance messages and information to be passed between the 2720 and the Central Office.

Line Coding Options:

Alternate Mark Inversion (AMI): This mode does not inherently account for ones density. To meet this requirement, each time slot can be reduced to 56 kbps and the Least Significant Bit (LSB) of each time slot set to one.

Bipolar 8 Zero Substitution (B8ZS): This mode assures proper bit density in the data stream. In this mode any data pattern can be transmitted without causing ones density errors. This mode allows for 64 kbps clear channel timeslots.

Switch S2-5: DS0 Channel Rate

Use Switch S2-5 to set the DS0 rate.

SW2-5	Setting
Off	56 kbps
On	64 kbps

Switch S2-6 and S2-7: Clock Mode

Set Switch S2-6 and S2-7 to determine the 2720's transmitter timing.

S2-6	S2-7	Clock Mode
Off	Off	***Network Clock***. Transmitter timing is derived from the received line signal.
On	Off	***Internal Clock***. Transmitter clock is derived from an internal oscillator.

NOTE 1: When using the Model 2720 as a high-speed short range modem, one unit of the link must be configured in Internal Clock mode, and the opposite end unit must be configured for Network Clock mode.

If the ERR LED on the front of the unit is flashing (or on) it could be an indication of a clocking problem. Double check your clock mode settings and Tx Clock Invert S1-3 settings.

Switch S2-8 Reserved

3.1.2 Switch S1

The chart below shows the default configurations for Switch S1. A description of all S1 options follows this table.

S1 SUMMARY TABE			
Position	**Function**	**Factory Default**	**Selected Option**
S1-1	RDL Type	On	V.54 RDL
S1-2	Reserved	On	
S1-3	Tx Clock Invert	Off	Normal
S1-4	Line Build Out	Off	0dB
S1-5		Off	
S1-6	Reserved	Off	
S1-7	Reserved	Off	
S1-8	Reserved	Off	

Switch S1-1: RDL Type

Switch S1-1 selects the type of Remote Digital Loopback that the 2720 will initiate when the RDL is initiated from this unit. The 2720 will respond to both the V54 and the CSU loopback regardless of the setting of S1-1

S1-1	RDL Type
On	Initiate a V.54 RDL loop when selected
Off	Initiate a CSU loopback when selected

Switch S1-2: Reserved

Switch S1-3: Tx Clock Invert

Switch S1-3 allows the user to invert the transmit clock originating in the 2720. When S1-2 is set for transmit clock, it may be necessary to invert the transmit clock to allow for delays due to long cables.

S1-3	Tx Clock Invert
On	Transmit clock is inverted
Off	Transmit clock is normal

Switches S1-4 and S1-5: Line Build Out

Use Switches S1-4 and S1-5 to set the Line Build Out (LBO). The Line Build Out varies the pulse shape and attenuation of the signal sent to the network. The amount of Line Build Out depends on NetLink™ T1's distance to the last repeater. The telephone company providing the service will advise on the amount of LBO necessary. In most cases the default setting will suffice.

SW1-4	SW1-5	Function
Off	Off	-(0dB)
On	Off	-7.5dB
Off	On	-15.0dB
On	On	-22.5dB

Switch S1-6 Through S1-8: Reserved

3.2 SOFTWARE CONFIGURATION

The Model 2720 features a menu-driven command system that allows you to monitor/configure its operating parameters. Follow the instructions below to configure the Model 2720 using the software selections:

1) Plug the 9-pin male end of the cable to your terminal or computer's DB-9 serial port and start up the terminal emulator software if necessary. Plug the miniature stereo plug into the rear of the unit. The small recessed jack on the left side of the unit is the control port jack.

   NOTE: If your terminal uses a DB-25 connector, please use a DB-9 to DB-25 Adapter to connect to the cable.

2) Power up the terminal and set its RS-232 port as follows:

   9600 Baud
   8 data bits, 1 stop bit, no parity
   Local echo off
   ANSI or VT-100 emulation

3) Here is an example of a terminal emulator setup session. In normal font are the various parameter types. In **bold type** are the values that should be used for best results. Your terminal program's setup screen may differ from this one:

Baud rate: **9600** Parity: **None** Data Length: **8** Stop Bits: **1**

Default terminal type:	**VT100**
Local Echo:	**Off**
Add Line Feeds after CRs:	**Off**
Received Backspace Destructive:	**On**
Backspace key sends:	**BS**
XON/XOFF software flow control:	**On**
CTS/RTS hardware flow control:	**Off**
DSR/DTR hardware flow control:	**Off**

4) When the unit is first turned on, the terminal screen may appear blank. Press the [Enter] key. If your serial connection is good, the unit will immediately display a password prompt. The following message will appear in the middle of the screen:

Patton Electronics
Menu Management

Enter Password: _

5) Type in the password and press [Enter]. The factory default password for the unit is (password is case sensitive):

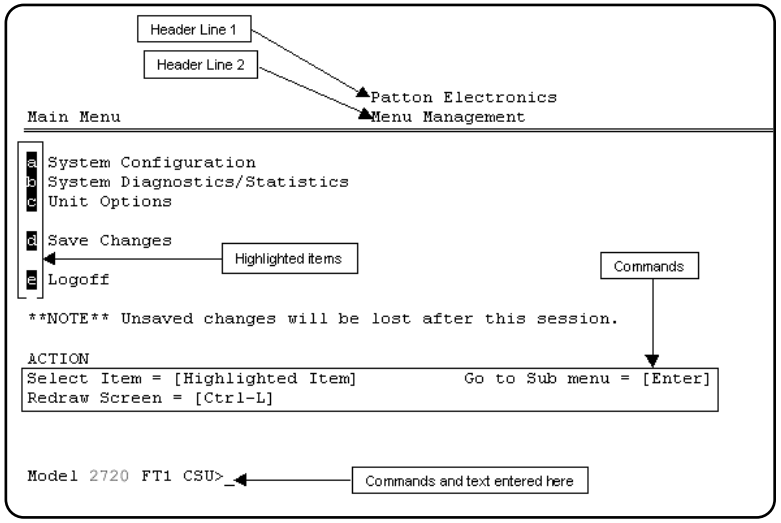
   patton

   NOTE: If the entry is incorrect, the password screen will clear and prompt you again for the correct password. The password you enter will not be shown. For security, asterisks will be displayed for each letter you type. The maximum length of the password, which can include any character the terminal can generate, is 16 characters.

6) The Model 2720 will then display the Main Menu screen.

3.2.1 Introduction to Main Menu

After entering the password, you may access all of the system's functions and parameters. The Main Menu looks like this:



HELPFUL HINTS

1. To make a selection, key the highlighted letter that corresponds to a menu selection.

2. To execute the selection, type [Enter/CR]

3. To toggle between options on a highlighted selection, Press [space].

4. Select **d** Save Changes from Main Menu after making modifications to any Model 2720 parameter. Otherwise, changes will be lost when the Model 2720 is turned off.

The Main Menu options are briefly described below.

a **System Configuration** options allow you to change various aspects of the Model 2720's operation, e.g., framing, line coding, and aggregate bandwidth.

b **System Diagnostics/Statistics** options allow you to monitor the network performance, initiate V.54 loops, local loops, and send test patterns. Network performance parameters are updated once a second, giving you the ability to quickly determine if there is a problem.

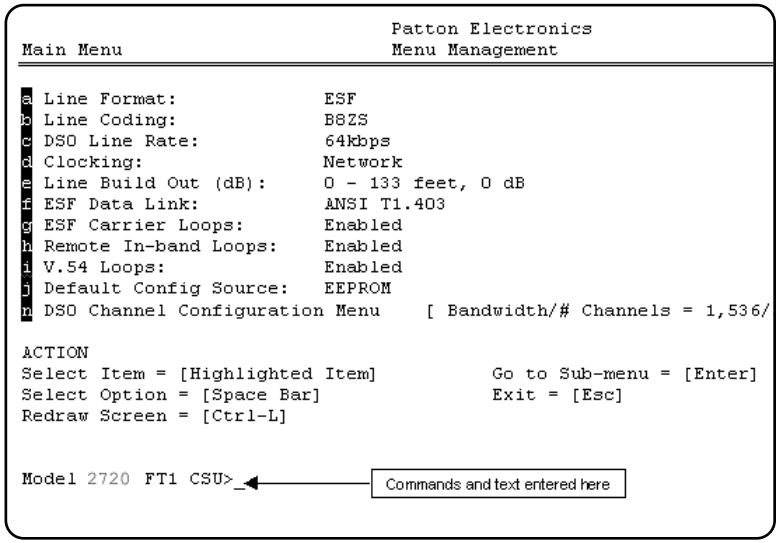
c **Unit Options** allow you to customize the Model 2720 for your location. You can change the default header names to give each unit a unique name and password. Also, you can reset the unit to its default settings without the manual. It also has a Service Information screen in case you need technical assistance from Patton Electronics.

d **Save Changes.** Once you have configured the unit to your satisfaction, you can save the changes permanently by executing the Save Changes command. This will update the unit's configuration and save all the parameters to permanent memory.

e **Logoff.** For security, log off the control menu by executing the Logoff command. This will blank the screen until an [Enter] key is pressed.

3.2.2 System Configuration

The default System Configuration menu looks like this:


Patton Electronics
Main Menu
Menu Management
a Line Format: ESF
b Line Coding: B8ZS
c DSO Line Rate: 64kbps
d Clocking: Network
e Line Build Out (dB): 0 - 133 feet, 0 dB
f ESF Data Link: ANSI T1.403
g ESF Carrier Loops: Enabled
h Remote In-band Loops: Enabled
i V.54 Loops: Enabled
j Default Config Source: EEPROM
n DSO Channel Configuration Menu [Bandwidth/# Channels = 1,536/
ACTION
Select Item = [Highlighted Item] Go to Sub-menu = [Enter]
Select Option = [Space Bar] Exit = [Esc]
Redraw Screen = [Ctrl-L]
Model 2720 FT1 CSU>_
Commands and text entered here

The System Configuration options are described below:

a Line Format: ESF *(default)*

Options: **ESF, D4, UNFRAMED**

D4: This is an older, but widely used, line format that does not provide FDL, so network interface performance cannot be monitored so easily. AT&T TR 62411 contains the specifications for this format and the ESF. D4 is also known as Superframe format. According to TR 62411, "The Superframe format…consists of 12 frames of 193 bits each for a total of 2316 bits. Each 193 bit frame consists of 192 bits preceded by one framing bit….the framing bit is time shared to both synchronize the terminal equipment and to identify the signaling frames." (Sec. 4.1.1)

ESF: This stands for Extended Superframe Format, a line format developed by AT&T. AT&T Technical Reference 54016 (TR 54016) defines the ESF, a format which is commonly used to allow monitoring of the network interface performance over the Facility Data Link (FDL). AT&T TR 62411 says, "the Extended Superframe Format "extends" the DS1 superframe structure from 12 to 24 frames…for a total of 4632 bits. It redefines the 8 kb/s channel previously used exclusively for terminal and robbed bit signaling synchronization." The ESF provides a 4 kb/s data link, called the FDL, which allows for in-service monitoring and fast troubleshooting. Certain network services require the ESF.

UNFRAMED: This is a special mode that allows you to achieve the maximum possible data rate of 1.544 Mb/s (million bits per second) by using the framing bits for data transmission. There is no signaling or FDL. This is commonly used for campus connections, and by the Federal government and the military. This format is not to be used when connecting to a public carrier's network without its permission. This provides one channel at a rate of 1.544 Mb/s. In addition, this format can be used with external clocking.

b Line Coding: B8ZS *(default)*

Options: **AMI, B8ZS, B7ZS.**

AMI: Alternate Mark Inversion defines a pulse as a "mark", a binary one, as opposed to a zero. In a T1 (DS1) network connection, signals are transmitted as a sequence of ones and zeros. Ones are sent as pulses, and zeros are sent as spaces, i.e., no pulse. Every other pulse is inverted from the previous pulse in polarity, so that the signal can be effectively transmitted. This means, however, that a long sequence of zeros in the data stream will cause problems, since the CSU/DSU receiving the signal relies on the signal to recover the 1.544 Mb/s clock. To get around this problem, one method is to limit the data rate per channel (known as a DS0, because it is a 64 kb/s portion of the DS1 frame or superframe) to 56 kb/s and forcing a pulse in the last data bit to ensure a minimum pulse density in the signal. If you must use AMI with a DS0 data rate of 64 kb/s, you should ensure that the data terminal equipment connected to the unit provides a minimally acceptable pulse density. For this reason, there are advantages to using B8ZS instead.

B8ZS: Bipolar violations occur when consecutive pulses are of the same polarity. In B8ZS, or Bipolar Eight Zero Substitution, bipolar violations are introduced deliberately to indicate that eight zeros have been transmitted. This special encoding is recognized by the receiver and decoded correctly. See AT&T TR62411 Section 4.2.2 for a detailed description of B8ZS. This enables information to be sent over a T1 connection without any constraints on the data's pulse density. This is the most acceptable way to accomplish 64 kb/s on each DS0 channel.

B7ZS: This stands for Bipolar Seven Zero Substitution. Instead of introducing bipolar violations, this method substitutes a one for a zero in bit 7 (out of 8) of a DS0 channel when the data in that channel are all zeros. This is a special form of AMI and is compatible only with special equipment. For most applications, AMI or B8ZS will suffice.

c **DS0 Line Rate**: 64kbps *(default)*

Options: **64kbps, 56kbps**

64kbps: Also known as Clear Channel, this takes full advantage of the available bandwidth in a DS0 channel. Implementing it usually requires B8ZS line coding. In certain cases, special equipment may implement Clear Channel using AMI or B7ZS. Consult the equipment manual for compatibility. Your carrier will advise you on whether to use 64 or 56 kb/s. Campus applications may not have such restrictions, enabling you to use 64kbps. In Unframed format, the 24 DS0s and the framing bits are combined to provide 1.544Mb/s for your use.

56kbps: This uses only the first seven bits of the DS0, limiting the data rate per DS0 channel to 56 kb/s. Your carrier will advise you on whether to use 64 or 56 kb/s. This is not available when using the Unframed format.

d **Clocking**: Network *(default)*

Options: **Network, Internal, External**

Network: This is the most commonly used setting when connecting to a carrier's network. In this mode, the unit recovers the clock from the received signal and uses it to transmit data. In this way the unit remains synchronized to a master clock. In campus applications, one of the units must be set to Internal clock, and the other end is set to Network clock. At all times, there must be only one clock source. Otherwise, clock slips and framing errors and bit errors may occur.

Internal: This is commonly used in campus applications, where the unit is not connected to the public telephone network directly. In this mode, the unit uses the on-board oscillator as the transmit clock source.

External: This is a special mode that should only be used with the Unframed format. In this mode, the unit requires a 1.544 Mhz clock signal from the DTE via the external clock pin on the DTE interface connector. Most applications will use Network or Internal clock modes.

e **Line Build Out (dB):** 0 – 133 feet, 0 dB *(default)*

Options: **0 – 133 feet, 0 dB**
133 – 266 feet
266 – 399 feet
399 – 533 feet
533 - 655 feet
-7.5 dB
-15.0 dB
-22.5 dB

This controls the transmitter signal strength and pulse shape. For most applications, the default setting will suffice. When connecting to a carrier connection, the carrier will determine what LBO is necessary. 0 dB provides the highest signal strength and therefore the longest distance, while –15.0 dB provides the lowest usable signal strength. The last setting, –22.5 dB, is usually only used to test the line and should not be used in normal applications.

f **ESF Data Link:** ANSI T1.403 *(default)*

Options: **ANSI T1.403, AT&T TR54016**

ANSI T1.403: This ANSI developed standard (see ANSI T1.403-1995: Network-to-Customer Installation—DS1 Metallic Interface) uses the FDL to send and receive one second Performance Report Messages (PRMs). The messages contain the NI performance over the last four seconds. Thus, up to three consecutive messages may be lost without loss of information. It is available only with ESF. When ANSI T1.403 is selected, requests to send AT&T performance reports (ref. AT&T TR 54016) are ignored.

AT&T TR54016: Developed by AT&T, this FDL method differs principally from the ANSI method in two ways: First, the ANSI method transmits messages continuously, whereas the AT&T method transmits a performance report only upon a request from the remote end for a report. Second, the AT&T method provides a historical summary, up to the last 24 hours, of NI performance. Only the service provider or special test equipment can send these requests. When AT&T TR54016 is selected, ANSI PRMs are still transmitted by the unit, but only PRMs sent by the carrier will be recognized. To receive PRMs from another customer unit (i.e., in a campus application), select ANSI T1.403. When the frame is not ESF, the FDL is disabled.

g **ESF Carrier Loops**: Enabled *(default)*

Options: **Enabled, Disabled**

The ESF format provides the CO the ability to put the customer installation's Model 2720 into loopback mode. The Model 2720 recognizes these special messages that are sent over the FDL. When enabled, the unit will respond to these loopback commands and go into or out of loopback mode. When disabled, the unit will not respond, although it still recognizes the loopback commands. When in loopback, the unit will remain in loopback until a loopback exit command is received or when the loopback timer times out. See **Unit Options** (**Section 3.2.4**) to make Loop Timeout choices. This feature allows the remote user to regain control should one be locked out after a loopback is initiated.

h **Remote In-band Loops**: Enabled *(default)*

Options: **Enabled, Disabled**

In ESF, D4 and Unframed formats, the unit can respond to special repeating codes in the data stream that represent loopback commands. The command to loop up (go into loopback) is a repeating pattern of 00001s. This pattern overwrites the normal data. When this code is detected for 5 seconds, the unit will go into loopback if the Remote In-band Loopback is Enabled. When a repeating code of 001s is received for 5 seconds, the unit loops down (goes out of loopback). The delayed recognition guards against false starts, since the code must be present for a long time continuously. When Disabled, the unit will recognize the codes but will not respond to them. The loopback timeout also applies to this feature.

i **V.54 Loops (RDL Only)**: Enabled *(default)*

Options: **Enabled, Disabled**

This is a special in-band loopback facility that sends a special pseudo-random pattern over the data stream. This is the only remote loopback that the unit can initiate. This is useful for campus applications when you need to put a remote unit in loopback. The remote unit responds to the V.54 loopback command, and the whole process takes only a few seconds to complete. This setting will enable/disable RDL from being initiated from either the control port or the DTE interface. It will also enable/disable the unit to respond to the V.54 command if received over the line. The duration of the loopback is limited by the loopback timeout setting. (See Unit Operations, paragraph 3.2.4, on pages 32 and 33.)

j **Default Config Source**: Switch (default)

Option: **EEPROM, Switch**

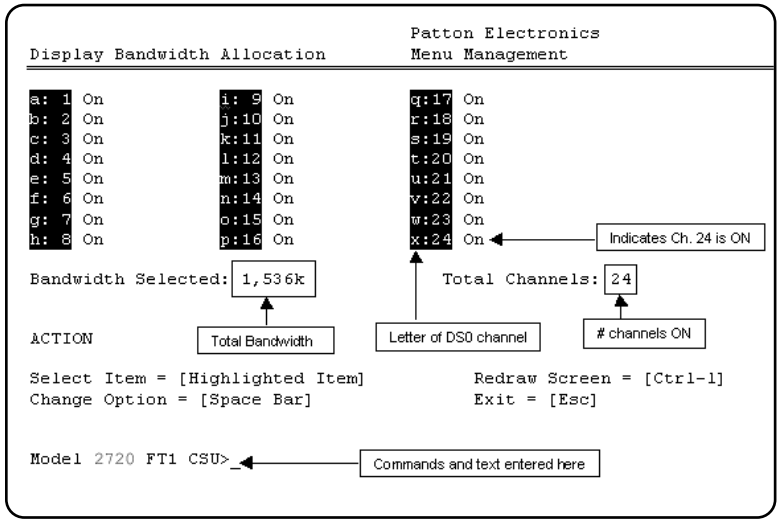
The Model 2720 can be initialized via the configuration in the onboard permanent memory (EEPROM) or via the internal DIP switches (Switch). Once the unit is powered up, you may change the settings through the control port or the DIP switches.

If you do not have a terminal, you may force the unit to use the DIP switches as the default configuration source by turning off the unit, setting all the DIP switches to the ON position, then powering on the

unit. This will cause the unit to enter a special mode. Then turn off the unit and change the switch settings to the desired settings. When you turn the unit on again, the unit will be set up with the selected switch settings.

n **DS0 Channel Configuration Menu:** [Bandwidth/# Channels = 1,536/24] *(default)*

The DS0 Channel Configuration Menu has a sub-menu that looks like this:

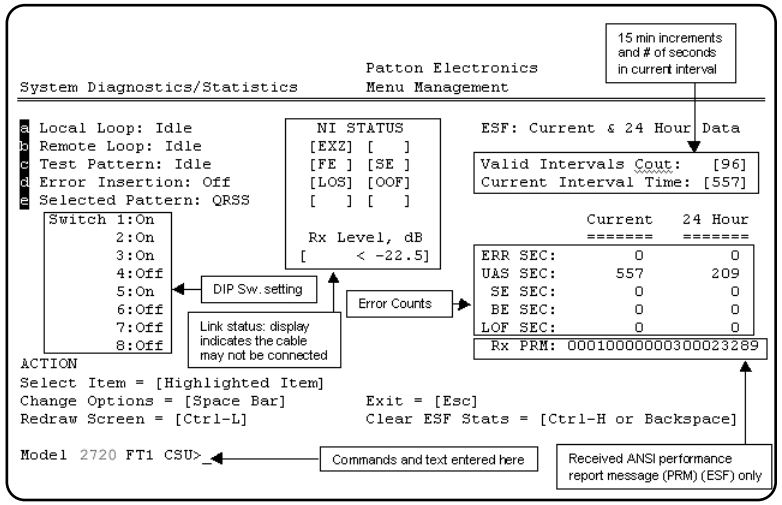


You may configure the Model 2720 to operate with any combination of active and inactive DS0 channels in this screen. When you execute the Save Changes command, the selected settings will be saved to permanent memory, and the system will be updated to operate with the new channel settings.

NOTE: In Unframed format, the Bandwidth Selected will display "1,544k," and the Total Channels will display "n/a." When the DS0 Channel Rate is 56kbps, the Bandwidth Selected will be a multiple of 56k, not of 64k. When using the DIP switches to set the bandwidth, the starting channel is always channel 1.

3.2.3 System Diagnostics

The System Diagnostics/Statistics screen looks like this:



NOTE: This screen is updated once per second.

The System Diagnostics/Statistics options and functions are described below.

a **Local Loop:** Idle *(default)*

The Local Loop is a bi-lateral loopback in which the data from the local DTE and the data from the remote unit are looped back to their respective sources (See **Section 5.3**). Activate this loop to test the each of the DTE's connection to the Model 2720.

The Local Loop test has four states:

Idle No user-controlled loopbacks are active.

LL The Model 2720 is in local loopback mode.

Off The Model 2720 is in remote or CO initiated loopback mode or sending a pattern. Local loopback is disabled.

LocP The Model 2720 is in Local Loopback mode, and is sending a test pattern.

b **Remote Loop** Idle *(default)*

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 2720s, as well as the communication link between them. Data from the local DTE is sent across the entire communication circuit and looped back to the local DTE.

The Model 2720 Initiating a RL can be in one of the following states:

Idle No user-controlled loopbacks are active.

TxPr The Model 2720 is sending the preparatory phase pattern lasting for approximately 2 -5 seconds.

WtAk The Model 2720 is waiting for an acknowledgement from the remote unit. If the remote unit does not respond, the WtAk message will remain on the screen.

RxAk The Model 2720 has received an acknowledgement from the remote unit.

Tout The Model 2720 is waiting before entering the Remote Loopback test mode.

TM The Model 2720 has successfully negotiated the Remote Loopback test and is in control of the remote unit. You may send a test pattern at this point by pressing:

c <spacebar>

TxTr The Model 2720 is sending a Terminate Loopback message to the remote unit. If the remote unit does not respond, the local unit will return to the Idle state.

Tx1s If the remote Model 2720 responds to the local NetLink-T1™'s terminate loopback request, the local unit then sends an all ones pattern before returning to the Idle state

TxP The Model 2720 is sending a test pattern while in Test Mode

IdlP The Model 2720 is sending a test pattern in place of data. The Model 2720 is not in test mode.

The Model 2720 receiving a RL can be in one of the following states:

RxPr The Model 2720 is receiving a preparatory pattern.

Sack The Model 2720, upon receiving a preparatory pattern, sends an acknowledgement message.

RL The Model 2720 is in remote loopback mode.

RxTr The Model 2720 is receiving a terminate loopback message.

Wt1s The Model 2720 is waiting for a sequence of all ones and will time out if it does not receive it.

IdleP The Model 2720 is sending a QRSS, 511 or 2047 pattern.

Off The Model 2720 is in local loopback.

c **Test Pattern** Idle *(default)*

Options: **Idle** or **Sending**

To send a pattern, press the 'c' key and press <spacebar> to send the test pattern. The "**OK**" message indicates the received test pattern is error-free. The "**BE**" message indicates errors in the received pattern.

Idle Indicates that Model 2720 is not sending a pattern.

Sending Indicates that 2720 is sending a pattern.

d **Error Insertion** Off *(default)*

Options: **On, Off**

You may inject intentional errors into the test pattern by turning Error Insertion ON. The Error (ERR) LED will blink once per second.

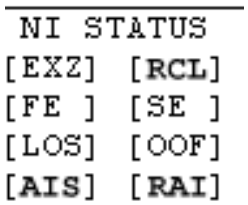
e **Selected Pattern**

Options: **QRSS, 511**, or **2047**

Use this option to select the test pattern used to test the link.

NI STATUS

The Network interface (NI) status is shown in the middle of the Diagnostics/Statistics screen. The brackets are empty when the link is operating normally. In this example, various two or three-letter messages are displayed within the brackets, illustrating what you may see if the Model 2720 is not connected at all or is in a loss of signal condition. Here are the eight status messages.



Excessive zeros [EXZ], i.e., lack of pulses, detected. This condition may occur if the unit is not connected to the network, in which case the EXZ is displayed continuously. If EXZ comes on intermittently, there may be a frame, line code or data rate mismatch between the near and far-end units.

Receiver Carrier Loss [RCL] occurs when 192 consecutive zeros have been detected at the network interface. RCL clears when a pulse is detected.

Frame Bit Error [FE] occurs when there is an error in the framing bit sequence. This may happen due to a disconnected line, mismatched framing formats or severe errors in the data stream. This error may indicate a noisy line or cable condition. This error may indicate a noisy line or cable connection if the frames appear to be set correctly.

Severe Frame Error [SE] occurs when the framing error exceeds a certain threshold of errors. This may happen due to a disconnected line, an extremely noisy connection, or mismatched framing.

Loss of Sync [LOS] occurs when the T1 framer in the unit cannot synchronize itself to the received data stream. This may happen due to a disconnected line.

Out of Frame [OOF] occurs when no valid frame structure can be found. This may happen due to a disconnected line or mismatched framing or mismatched framing.

Alarm Indication Signal [AIS] indicates that the remote unit or the central office is sending a Blue Alarm, because it is not receiving a signal; the alarm is an unframed all-ones signal, mainly used to keep the line alive and to indicate that it is not receiving any signal. This may indicate that the local unit is receiving a good signal, but that the transmit link may be broken.

Receive Alarm Indication [RAI] indicates that the local unit is receiving a Yellow Alarm. This alarm is sent by the remote unit or the central office when it loses the received signal. This indicates the local unit's transmitted signal is not reaching the remote unit.

Rx Level The Model 2720 displays the current received signal strength in dB. There are four level ranges detected:

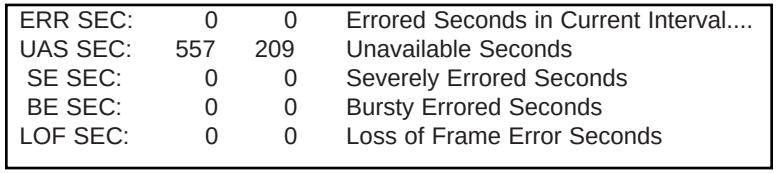
+2 to –7.5
-7.5 to –15
-15 to –22.5
< -22.5

Valid Interval Count & Current Interval Time

The Valid Interval Count and Current Interval Time display the number of valid 15 minute intervals in the last 24 hours and the number of seconds which have elapsed in the current interval, respectively. The Valid Interval Count saturates at the count of 96 (96 * 15min = 24 hours), while the Current Interval Time rolls over after 900 counts. When the counter rolls over, it is reset to zero, and the Interval Counter is incremented by one if the count is less than 96.

Error Counters

These error counters give a second-by-second snapshot of the link performance. To clear all counters, press the [Backspace] key. If your keyboard does not have this key, you can press a two-key combination to affect the same result: Hold down the [Ctrl] key and then press the [H] key. This will send to the unit the Ctrl-H character, which is the same as pressing the [Backspace] key.


ERR SEC: 0 0 Errored Seconds in Current Interval....
UAS SEC: 557 209 Unavailable Seconds
SE SEC: 0 0 Severely Errored Seconds
BE SEC: 0 0 Bursty Errored Seconds
LOF SEC: 0 0 Loss of Frame Error Seconds

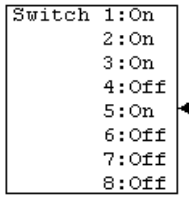
Rx PRM

The NetLink-T1™ transmits ANSI performance report messages once a second when the framing mode is ESF. When the ESF Data Link is set to ANSI T1.403, the unit recognizes PRMs with addresses of 38h or 3Ah. The address 3Ah indicates the PRM is coming from a Carrier, whereas the address 38h indicates the PRM is coming from a Customer. When the ESF Data Link is set to AT&T TR54016, the unit recognizes Carrier-originated PRMs, which have an address of 3Ah.

Rx PRM: 00010000000300023289

Current DIP Switch Settings

The Switch settings are displayed here to facilitate troubleshooting your unit without opening up the unit first.



3.3.6 Unit Information

The Unit Options screen looks like this (factory default):

```
                                        Patton Electronics
Unit Information                        Menu Management
================================================================================

a Header Line 1: Patton Electronics   Error Indications
b Header Line 2: Menu Management      -----------------
c Password:      patton               Fifo Slips:       0x00
d Loop Timeout:  00:30       (hh:mm)  Clk Slips:        0x00
e Tx Data Clock: Ext Tx Clock
f Tx Clock Inv:  Normal Tx Clock
g Set to Default Configuration

h Service Information
i Clear Errors:

ACTION

Select Item = [Highlighted Letter]              Accept Selection = [Enter]
Change Options = [Space Bar]                    Exit = [Esc]
                                                Redraw Screen = [Ctrl-L]


Model 2710RC FT1 CSU>_
```

Header Line 1 & Header Line 2

Headers 1 and 2 are provided for easy identification of your unit after installation. You may want to give each unit a unique name via the header lines to help distinguish one unit from another. You can enter a header up to 40 letters long. Two lines provide 80 letters for your use. That's a lot of flexibility!

Password

The Password facility provides security by allowing only those who know the correct password to configure the unit via the control port. You can still configure the unit via the DIP switches. The password can be up to 16 characters long, with no restriction on the combination of characters you can use, so be sure to remember the password. If you lose your password, you will lose the ability to access the unit via the control port.

Loop Timeout

The Loop Timeout setting can be set to one of the following:

00:05 = five minutes
00:10 = ten minutes
00:15 = fifteen minutes
00:30 = thirty minutes (default setting)
00:45 = forty-five minutes
01:00 = one hour
01:30 = 90 minutes
02:00 = two hours
03:00 = three hours
NEVER = forever—the unit will remain in loopback without user intervention.

Tx Data Clock

This option selects the clock that is used to accept the Transmit Data from the DTE interface. Standard DTE interfaces will transmit data with respect to the External Clock. In some cases a DTE interface will transmit with respect to the Transmit clock sent out from the 2720. Please review the information provided with your DTE equipment for more information on its' operation. In most cases when there are errors on the line only in the direction of the transmit data either Tx Data Clock or Tx Clock Invert can be changed to solve the problem.

Tx Clock Invert

This option allows the user to invert the transmit clock originating in the 2720. When Tx Data Clock is set for transmit clock, it may be necessary to invert the transmit clock to allow for cable delays.

Set to Default Configuration

You may set the NetLink-T1™ to its factory default configuration, except for the header lines and the password, by executing the Set to Default Configuration command.

4.0 INSTALLATION

The Model 2720 is equipped with DTE, network, and power interfaces. This section briefly describes connection to each.

4.1 DTE INTERFACE CONNECTION

The DTE interface is a V.35 DCE presented as an M/34 male connector. This interface is designed to plug directly into a DTE interface (See Appendix D for V.35 interface pin assignments).

4.2 NETWORK INTERFACE CONNECTION

The Network Line Interface is an eight position keyed modular jack configured as a RJ-48C. This interface will need to be configured to match the line parameters (i.e. framing, line coding, etc.) supplied by the central office.

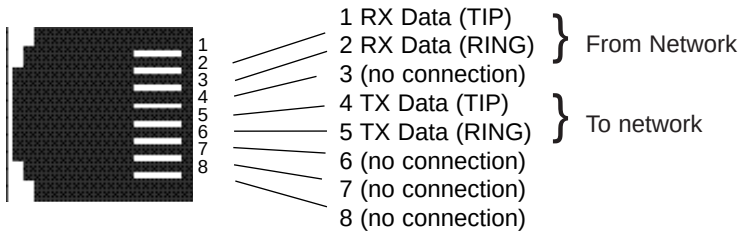
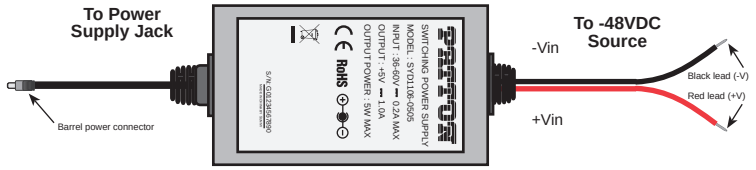


Figure 2. Model 2720 twisted pair line interface.

NOTE:
If the Model 2720 is being used for private short range modem applications, the twisted pair cable connected to its port will need to be a crossover cable. See Appendix D for Interface pin assignments.

4.3 DC POWER SUPPLY

The 36-60 VDC DC to DC adapter is supplied with the DC version of the Model 2720. The black and red leads plug into a DC source (nominal 48VDC) and the barrel power connector plugs into the barrel power supply jack on the 2720.



5.0 OPERATION

Once the NetLink-T1™ is installed and configured properly it is ready to place into operation. This section describes the function of the LED indicators, and the use of the loopback and pattern test modes.

5.1 LED DESCRIPTIONS

The NetLink-T1™ is equipped with six LED indicators that monitor the status of communication. Figure 12 (below) shows the location of the LEDs on the NetLink-T1™ Series front panel.

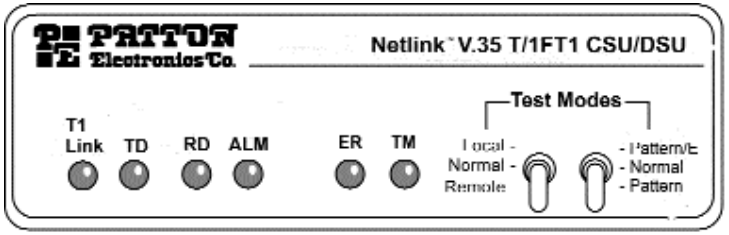


Figure 3: 2720/C Front Panel

T1 Link Solid green indicates that the end to end TI link is up. Signifying that the link is active. The TI link LED is off when the link is down

TD When the unit sends a one, the TD LED is green. When it sends a zero, the TD LED is orange. Moreover, the TD LED is active only in active DS0 channels. In inactive channels, the TD LED is off.

RD When the unit receives a one, the RD LED is green. When it receives a zero, the RD LED is orange. Moreover, the RD LED is active only in active DS0 channels. In inactive channels, the RD LED is off.

ALM The alarm LED indicates the presence of a Blue or Yellow Alarm, or Out of Frame condition. The ALM LED will blink on every half-second. Alarms may occur due to:

- Loss of Synchronization
- Loss of Frame
- AIS (Blue Alarm)
- RAI (Yellow Alarm)

ER The error LED indicates various error conditions, including framing bit errors, excessive zeros, controlled slips, severe errors, or bit errors (when sending V.52 test patterns). When sending a test pattern, the LED will remain lit if the unit does not receive the identical pattern. When it receives the correct pattern, the LED will turn off. If error insertion is on, the LED will blink once a second if everything is operating properly.

TM The test indicator LED blinks with a specific pattern depending on the type of test mode. When the unit is in local analog loop, the LED will blink on briefly. When the unit is in remote loop, the TM LED will blink off briefly. When the unit is sending a test pattern or is putting the remote unit into V.54/CSU loopback, the TM LED will stay on. These are the test modes:

- V.54/CSU Loopback & V.52 Patterns
- D4 Line Loop (CO initiated)
- ESF Line Loop (CO Initiated)
- ESF Payload Loop (CO Initiated)

5.2 LOOP (V.54 & TELCO) DIAGNOSTICS

The NetLink-T1™ offers three V.54 loop diagnostics and is compatible with two Telco loop diagnostics. Use these diagnostics to test the CSU/DSU and any communication links. These tests can be activated via the software control port (See Section **3.2.3 System Diagnostics**), via signals on the serial port interface or the front panel switch.

5.2.1 Operating Local Loopback (LL)

The Local Loopback (LL) test checks the operation of the local NetLink-T1™, and is performed separately on each unit. Any data sent to the local NetLink-T1™ in this test mode will be echoed (returned) back to the user device (i.e., characters typed on the keyboard of a terminal will appear on the terminal screen).

To perform a LL test, follow these steps:

1. Activate LL. This may be done in one of three ways:

   a. Enter **a** **Local Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until "LL" appears next to the **a** **Local Loop** option.

   b. Activate the "LL" signal on the DTE. If you are not sure which lead is the "LL" signal, please refer to Appendix D.

   c. Toggle the front panel switch to the "Local" position.

2. Verify that the data terminal equipment is operating properly and can be used for a test.

3. Perform a V.52 BER (bit error rate) test as described in **Section 5.3**. If the BER test equipment indicates no faults, but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the NetLink-T1.

5.2.2 Operating Remote Digital Loopback (RL)

The Remote Digital Loopback (RL) test checks the performance of both the local and remote NetLink-T1™, as well as the communication link between them. Any characters sent to the remote NetLink-T1™ in this test mode will be returned back to the originating device (i.e, characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote NetLink-T1™ and looped back).

To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in three ways:

   a. Enter **b** **Remote Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until "RL" appears next to the **b** **Remote Loop** option.;

   b. Activate the "RL" signal on the DTE. If you are not sure which lead is the "RL" signal, please refer to Appendix D.

   c. Set the front panel switch to 'Remote'.

2. Perform a bit error rate test (BERT) using the internal V.52 generator (as described in **Section 5.3**), or using a separate BER Tester. If the BER test indicates a fault, and the Local Line Loopback test was successful for both NetLink™s, you may have a problem with the twisted pair line connection.

5.2.3 CSU Loop

The NetLink-T1™ also responds to central office initiated loop commands. The NetLink-T1™ will implement the "loop up" command when it recognizes the pattern "10000" in the data stream for a minimum of 5 seconds. The "loop down" command is implemented by the pattern "100" in the data stream for a minimum of 5 seconds.

When operating in ESF framing mode, loopback commands are issued via the Facility Data Link (FDL). The line loop message will cause a loop back before data enters the framer portion of the CSU. The payload loop message will cause the NetLink-T1™ to loop data after the framer portion of the CSU.

The NetLink-T1™ will respond to Universal Loopback De-activate to clear all central office loops.

5.3 BIT ERROR RATE (V.52) DIAGNOSTICS

The NetLink-T1™ offers three V.52 Bit Error Rate (BER) test patterns. These test patterns may be invoked along with the LAL and RDL tests to evaluate the unit(s) and the communication links.

When a 511, 2047, or QRSS test is invoked, the NetLink-T1™ generates a pseudo-random bit pattern of 511 bits, 2047 bits or 2^{20} bits, respectively, using a mathematical polynomial. The receiving NetLink- T1™ then decodes the received bits using the same polynomial. If the received bits match the agreed upon pseudo-random pattern, then the NetLink-T1™(s) and the communication link(s) are functioning properly.

511	Initiates a built-in 511 bit pseudo-random pattern generator and detector.
2047	Initiates a built-in 2047 bit pseudo-random pattern generator and detector.
QRSS	Initiates a built-in 2^{20} bit pseudo-random pattern generator and detector.

To perform a V.52 test, follow these steps:

1. Activate the local loopback or remote loopback diagnostic.
2. Activate the test pattern. This may be done in one of two ways:

   a. Enter **e** **Selected Pattern** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until the desired test pattern appears.

   b. Enter **c** Test Pattern and toggle the [Spacebar] to send the selected pattern.

   c. One of two result codes will appear to the right of the **c** **Test Pattern** listing:

      OK Indicates that the received test pattern is error-free.

      BE Indicates that there are errors in the test pattern (to deliberately insert errors in the pattern, toggle **d** **Error Insertion** to ON).

APPENDIX A

PATTON NETLINK-T1 MODEL 2720

SPECIFICATIONS

WAN Speed:	1.544 Mbps
WAN Connection:	RJ-48C
Nominal Impedance:	100 Ohms
DTE Interface:	EIA-530, ITU/T V.35, M/34 female, or EIA-530, DB25 female
Line Coding:	AMI/B8ZS
Line Framing	D4/ESF/Unframed
Receive LBO:	Automatic
Transmit LBO:	Selectable - 0, 7.5, 15, or 22.5 dB, plus DSX-1
Clock Options:	Internal, external or network clock
Diagnostics:	Responds to CO-initiated D4 loopup and loopdown codes, ESF line loop and payload loop FDL messages, Universal Loopback De-activate message
Standards:	AT&T TR62411, TR54016, ANSI T1.403
Power Supply:	120VAC, 60 Hz to 5VDC 300mA wall-mount transformer or UI 100-240VAC, 50-60 Hz to 5 VDC, 2A desktop transformer
Dimensions:	3.5”L x 2.1”W x 0.78”H (9.0 x 5.3 x 1.9 cm) 5.0’’ L x 42’’ W x 1.5’’ H

APPENDIX B

PATTON NETLINK-T1™ MODEL 2720

CABLE RECOMMENDATIONS

The Patton Model 2720 Series has been performance tested by Patton technicians using twisted-pair cable with the following characteristics:

Wire Gauge	Capacitance	Resistance
19 AWG	83nf/mi or 15.72 pf/ft.	.0163 Ohms/ft.
22 AWG	83nf/mi or 15.72 pf/ft.	.0326 Ohms/ft.
24 AWG	83nf/mi or 15.72 pf/ft.	.05165 Ohms/ft.

To gain optimum performance from the Model 2720 Series, please keep the following guidelines in mind:

- *Always* use **twisted pair** wire—this is not an option.
- Use twisted pair wire with a capacitance of 20pf/ft or less.
- Avoid twisted pair wire thinner than 26 AWG (i.e. avoid AWG numbers higher than 26)
- Use of twisted pair with a resistance greater than the above specifications may cause a reduction in maximum distance obtainable. Functionality should not be affected.
- Many environmental factors can affect the maximum distance obtainable at a particular site.

APPENDIX C

PATTON NETLINK-T1™ MODEL 2720 FACTORY REPLACEMENT PARTS AND ACCESSORIES

Patton Model #	Description
10 - 09F	6 Foot Control Port Cable, 25mm to DB9F
07M2720	User Manual
2720/C/VI	T1 N x 64 CSU/DSU(M/34 female, UI)
2720/B/VI	T1 N x 64 CSU/DSU(DB25 female,UI)
2720/I/VI	T1 N x 64CSU/DSU(10BaseTEthernet,VI)

APPENDIX D

PATTON NETLINK-T1™ MODEL 2720

INTERFACE PIN ASSIGNMENT

RJ-48C T1 (DS0) Network Interface (Female Modular Jack)

Pin #	Signal
1	RX Data (TIP 1)
2	RX Data (RING1)
4	TX Data (TIP)
5	TX Data (RING)

TRS Jack (RS-232 Control Port)

Pin #	Signal Source
Tx Data	From Model 2720
Rx Data	To Model 2720
Sleeve	N/A

RS-232 Control Port (Signals at DB-25 Connector)

Pin#	Signal	Signal Direction
3	Receive	From 2720
2	Transmit Data	To 2720
7	Ground	

RS-232 Control Port (Signals at DB-9 Connecter)

Pin#	Signal	Signal Direction
3	Receive	From 2720
2	Transmit Data	To 2720
7	Ground	

PATTON ELECTRONICS MODEL 2720 INTERFACE PIN ASSIGNMENT

M/34 Connector, Terminal Interface

Pin #	Signal
A	GND (Earth Ground/Shield)
B	SGND (Signal Ground)
D	CTS (DCE Source)
E	DSR (DCE Source, Always On)
F	CD (DCE Source)
L	LL (Local Loop, DTE Source)
M	TM (Test Mode Indicator, DCE Source)
N	RL (Remote Loop, DTE Source)
P	TD (Transmit Data +, DTE Source)
R	RD (Receive Data +, DCE Source)
S	TD/ (Transmit Data -, DTE Source)
T	RD/ (Receive Data -, DCE Source)
U	XTC (Transmit Clock +, DTE Source)
V	RC (Receiver Clock +, DCE Source)
W	XTC/ (Transmit Clock -, DCE Source)
X	RC/ (Receiver Clock -, DCE Source)
Y	TC (Transmitter Clock +, DTE Source)
AA	TC/ (Transmitter Clock -, DTE Source)
KK	Aux. Power Input (+5VDC @ 300mA)

APPENDIX E

PATTON NETLINK-T1™ MODEL 2720

EIA-530 INTERFACE PIN ASSIGNMENT

DB-25 Female Connector, Terminal Interface

Pin #	Signal
1	FG (FrameGround)
2	TD (Transmit Data-A, DTE Source)
3	RD (Receive Data-A, DCE Source)
4	RTS (Request to Send-A, DTE Source)
5	CTS (Clear to Send-A, DCE Source)
6	DSR (Data Set Ready-A, DCE Source)
7	SGND (Signal Ground)
8	CD (Carrier Detect-A, DCE Source)
9	RC/ (Receiver Clock-B, DCE Source)
10	CD/ (Carrier Detect-B, DCE Source)
11	XTC/(External Transmitter Clock-B, DTE Source)
12	TC/(Transmitter Clock-B, DTE Source)
13	CTS/(Clear to Send-B, DCE Source)
14	TD/(Transmit Data-A, DTE Source)
15	TC(Transmitter Clock-B, DCE Source)
16	RD (Receive Data-A, DCE Source)
17	RC (Receiver Clock-A, DCE Source)
18	LL (Local LIne Loop)
19	RTS/(Request to Send-B, DTE Source)
20	DTR (Data Terminal Ready-A, DTE Source)
22	DSR/ (Data Set Ready-B, DCE Source)
23	DTR/(Data Terminal Ready-B, DTE Source)
24	XTC (External Transmitter Clock-A, DTE Source)
25	TM (Test Mode)

APPENDIX E

(continued)

PATTON ELECTRONICS MODEL 2720 INTERFACE PIN ASSIGNMENT

X.21 Interface
(DB-15 Female Connector)
(DTE /DCE Configuration)

Pin #	Signal
1	Frame Ground
2	T (Transmit Data-A)
3	C (Control-A)
4	R (Receive Data-A)
5	I (Indication-A)
6	S (Signal Element Timing-A)
7	BT (Byte Timing-A)
8	SGND (Signal Ground)
9	T/ (Transmit Data-B)
10	C/ (Control-B)
11	R/ (Receive Data-B)
12	I/ (Indication-B)
13	S/ (Signal Element Timing-B)
14	BT/ (Byte Timing-B)